My invention relates broadly to windows and more particularly to hardware for double hung sliding and reversible window sashes.

One of the objects of my invention is to provide a simplified arrangement of hardware for a double hung sliding and reversible window sash installation which enables such sashes to be operated in any desired vertically slideable position or in any tilting position.

Still another object of my invention is to provide an improved construction of hardware for double hung reversible window sash including weather stripping for air conditioning and protective purposes.

Still another object of my invention is to provide a simplified construction of hardware assembly for operation of double hung sliding window sash in tilting and reversing arrangements while providing a tight seal between the sash and frame when the sash is moved to normal vertically slideable positions.

A further object of my invention is to provide a construction of hardware assembly for converting double hung slideable windows into tiltable and angularly adjustable windows in which pintle members are carried by the window sash for coaction with recessed sash strips arranged to vertically slide in the double hung window stiles.

A still further object of my invention is to provide a construction of hardware assembly for installation on double hung reversible windows in which pintle members are arranged to be mounted on the window sash for coaction with recessed sash strips vertically slideable in the double hung window stiles with means associated with the pintles for latching the window sash in selected tilted positions with respect to the window stiles.

Other and further objects of my invention reside in an improved assembly of hardware for enabling double hung vertically slideable window sashes to be convertibly used in tilting or reverse positions as set forth more fully in the specification hereinafter following by referring to the accompanying drawings, in which:

Figure 1 is a front elevational view of a double hung vertically slideable window in which the sashes are equipped with the hardware of my invention for enabling the sashes to be tilted or reversed in selective angular planes; Fig. 2 is a vertical sectional view taken on line 2—2 of Fig. 1 and illustrating the sash in dotted line position; Fig. 3 is a fragmentary elevational view of a window sash showing the sash strip interposed between the window sash and the window stile and interlocked for vertical adjustment in the normal manner intended for the operation of double hung window sashes; Fig. 4 is a vertical sectional view through the portion of the sash and stile of the window illustrated in Fig. 3 with certain of the parts partially broken away and shown in side elevation; Fig. 5 is a fragmentary vertical sectional view of the sash illustrated in Figs. 3 and 4 but showing the condition just prior to an orientation of the sash with the weather stripping withdrawn from the sash strip to allow tilting of the window sash; Fig. 6 is a view similar to the view illustrated in Fig. 5 but showing the window sash in tilted position with respect to the vertical window frame; Fig. 7 is a horizontal sectional view taken on substantially line 7—7 of Fig. 4; Fig. 8 is a horizontal sectional view taken substantially on line 8—8 of Fig. 4; Fig. 9 is a enlarged sectional view taken substantially on line 9—9 of Fig. 6 and illustrating the sash in tilted position with respect to the sash stripping and double hung window frame; Fig. 10 is a vertical sectional view taken substantially on the line 10—10 of Fig. 3 and illustrating the weather stripping in extended position between the sash and the sash strip; Fig. 11 is a perspective view illustrating the spring member which is employed in association with the sash strip for floatatably mounting the window sash between the window stiles; Fig. 12 is a perspective view of a fragmentary portion of the sash strip showing the mortise therein for centering the spring member of Fig. 11; Fig. 13 is a view similar to the view illustrated in Fig. 12 but showing the opposite side of the sash strip including the recessed portion for receiving the pintle of the window sash, the recessed portions for the cam locks, the bearing surface over which the cam locks slide, and the mortises for receiving the window stripping carried by the window sash; Fig. 14 is a fragmentary perspective view of the edge of one of the window sashes embodying my invention and showing the pintle, the locking cams, and the weather stripping associated therewith for coaction with the sash strip of Figs. 12 and 13; Fig. 15 is an elevational view of one form of hardware which is applied to the window sash; Fig. 16 is a side elevational view of the hardware shown in Fig. 15; Fig. 17 is a transverse sectional view taken on line 17—17 of Fig. 15; Fig. 18 is a perspective view of the weather strip and the actuator connected therewith which is employed in the double hung sash of my invention; Fig. 19 is a fragmentary perspective view of a portion of a sash strip showing a modified form of hardware carried thereby; Fig. 20 is a fragmentary perspective view of a portion of the window sash carrying the modified form.
of hardware which coacts with the form of hardware illustrated on the sash strip in Fig. 19; Fig.
21 is a transverse sectional view taken through the hardware which is carried by the sash in the a-
arangement shown in Fig. 20; Fig. 22 is a top plan view of a further modified form of hardware, in-
cluding a pindle and locking cams adapted to be carried by the window sash, the hardware being partially broken away and shown in horizontal section; and Fig. 23 is a view similar to the view shown in Fig. 21 illustrating a further modified form of hardware adapted to be mounted on the window sash.

The construction of hardware shown herein, for converting double hung window sash installa-
tions to enable the sashes to be operated either in vertically sliding arrangement or in tilting and reversing arrangement, is an improvement over the hardware set forth in my Letters Patent 2,332,500, granted October 26, 1943, for Safety reversible window, and my co-pending application Serial No. 698,581, filed July 17, 1945, for Safety reversible window, now Patent 2,433,678, dated July 8, 1947. In the reversible window con-
struction of my present invention the hardware is considerably simplified and production costs decreased while increasing the effectiveness of operation of the window. In the hardware of my present invention a pindle member is secured to diametrically opposite positions of the window sash and is associated with a pair of cam mem-
ers. A sash strip which is slidable in the window sash is provided in each side of the window sash and carries a beveling plate and a central recess which coacts with the cam members of the window sash, respectively. The sash strip is pro-
vided with yieldable means operative to con-
tinuously urge the sash strip toward the window sash for floatingly suspending the sash between the sides of the window frame. In this floatating position the sashes may be freed by retraction of normally interlocking weather stripping and the tilting of the window frame sash to any desired angular position through the window frame. The arrange-
ment of cam members carried by the hardware on the window sash and the cam bers carried by the sash strips is such that the sashes may be locked in vertically sliding position with respect to the sash strips for operation of the window as a normal double hung window. However, upon retraction of the window stripping, the window sash may be shifted to a tilting posi-
tion in which the sash strips are each laterally displaced against the yielding action of the springs carried thereby to a position gripping the opposite window sashes for fractionally maintain-
ing the window sash in any desired angular position to which the sash may be moved. When the reversible window is to be restored to operation as a double hung vertically slidable window, the sashes are moved to a position in alignment with the sash strips, whereupon, the cam members on the hardware carried by the window sashes enter the recesses in the hardware carried by the sash strips freeing the sash strips from frictional en-
gagement with the window sashes and restoring the floatating support of the window sashes through the spring means carried by the window sash, thereby enabling the window sashes to again operate freely as a normal double hung vertically slidable window.

Referring to the drawings in more detail, reference character 1 designates the window frame of the double hung vertically slidable window having lower sash 4 and upper sash 5 slidable in the siles 2 and 3. The usual sash weights and guide pulleys therefor have been illustrated as part of the standard double hung vertically slidable window. The sashes 4 and 5 are each cut down at opposite sides to a width narrower than normal, and the reduced width built up to the original normal width by sash strips represented at 6 and located at each opposite edge of the sashes 4 and 5. Each sash strip 6 serves as a supporting means for the sash through sash cord connecting means represented at 6a. The opposite edges of each sash are mortised as represented at 7 to serve as a housing for the weather stripping represented at 8.

The weather stripping 8 is shown more clearly in Fig. 18 as provided with a recessed leading edge represented at 9 and a horizontally extending actuator 10 secured at one side of the weather strip 8. The actuator 10 is offset from the center of the weather strip so that the actuator 10 in passing through the window sash represented at 4 is offset from the plane of the window glass represented at 11 and may be advanced or retracted with respect thereto in a plane removed from the plane of the glass 11. The actuator 10 passes through an escutcheon plate 12 secured to the inside of the frame of the window sash 4 and which serves as a bearing surface for the cam member 14 carried by manually operable lever device 15 which is pivoted at 16 on the actuator 10. The lever device 15 is cut away or recessed at 17 to allow the lever member to move to the position represented in Fig. 4 in which weather strip 8 is projected in slots 1 by means of the symmetrically disposed springs 18 and 19 without obstruction by stop pin 20 on actuator 10. The stop pin 20 carried by actuator 10 serves to limit the outward projection of the weather strip 8 against the action of coil springs 18 and 19 and at the same time serves as a stop for the cam 16 of lever 15 in the position illustrated in Fig. 4 when the weather strip 8 is retracted into the slot, groove, or mortise 7. The actuator 10 also carries a diametrically dis-
paced stop 21 which serves as an abutment for the sash strip 8 in the position illustrated in Fig. 6, while the sash is in a position for angular or tilting movement for reversible operation within the window frame.

The weather strip 8 is recessed at 9 to permit the weather strip to clear at its center the hard-
ware fitting which is carried by each opposite side of the sash. This hardware fitting comprises a plate member 22 which is provided with a hori-
zontally projecting pindle 23 at the center thereof and a pair of symmetrically arranged cam members 24 and 25 at opposite sides of pindle 23. The plate 22 is provided with symmetrically arranged screw apertures 26, 27, 28 and 29 therein for the passage of securing screws 26a, 27a, 28a, and 29a. Axially disposed opposite portions of plate 22 are recessed as represented at 22a and 22b for the passage of the weather strip 8 on opposite sides of the recess 9 thereon.

The coacting sash strip at each side of the window sash is constructed as represented more clearly in Figs. 12 and 13 wherein the side of the sash strip 6 which directly contacts the edge of the sash 4 is mortised as represented at 30 for receiving the weather strip 8 when the weather strip 8 is in projected position. The central por-
tion of the sash strip 6 is provided with a hard-
ware fitting represented by plate member 31 as having a central recess 32 adapted to receive pindle 23 extending from the sash 4 and having
sent in Figs. 19, 20, 21, 22, and 23. In the construction illustrated in Fig. 17 a plate member of relatively low-grade metal 22 is provided and is perforated to receive metallic inserts of high-grade tool steel constituting the segments 23 and 27. The plate 31 is secured to the sash strip 6 by screw members which pass through apertures represented at 33. The opposite ends of the plate member 31 are recessed as represented at 31a and 31b to receive the projecting portions of the window sash 4. The sash strip 6 is provided with a symmetrically arranged mortise represented at 35 within which I mount the flat leaf spring 37. The flat leaf spring 37 is shaped to conform with the mortises 36 in the sash strip 6. It will be observed that mortise 36 has a central elevated portion 36a, and a pair of oppositely disposed pocket-like recesses in each end thereof. The flat spring 37 has a center portion 37a which is shaped to snap over the raised central portion 36a of mortise 36 to provide a support for oppositely extending flat yieldable spring-like portions 37b and 37c in the mortise 36. Portions 37b and 37c tend to continuously bear against the opposite stiles of the window frame for continuously urging the sash strip 6 toward the opposite sides of the sash illustrated, for the alignment of yieldable spring 37 is important because of the manner of locking the sashes in angularly shiftable and reversible position. The sash strip 6 is recessed at 33 immediately behind the recess 32 in plate 31 so that pindle 23 may project through plate 31 and be engaged by the mortise 4. The alignment of yieldable spring 37 is also important because of the manner of locking the sashes in angularly shiftable and reversible position. The sash strip 6 is taken up by yieldable spring 37, as represented in Figs. 3, 4, 7, and 8. Under these circumstances, wherein the window sash is free for vertically slidable movement, weather strip 6 is projected into interlocking engagement between sash 4 and sash strip 6. However, when the sashes are prepared for angular shiftable movement the weather strip 6 is retracted from engagement with sash strip 6 as represented in Fig. 5. Under these conditions sash movement may be swivel, being angularly shifted from the position illustrated in Figs. 4, 5, 7, and 8 to the position illustrated in Fig. 6. As the sash 4 commences the angular path of movement cam members 24 and 25 ride out of recesses 34 and 35 and establish frictional engagement with the bearing surface of plate 31 on sash strip 6. The area on plate 31 intermediate recesses 34 and 35 is left plain and solid to serve as a trackway over which cam members 24 and 25 are arranged to ride as represented in Figs. 6 and 9. The cam members 24 and 25 force sash strip 6 transversely of the window frame 1 and establish a gripping engagement between sash strip 6 and the stiles 2 of the window frame 1. This gripping engagement is effected against the action of flat springs 37. The opposite ends of flat spring 37 represented at 37b and 37c move into the recesses in sash strip 6 formed by the mortise 36. The cam members 24 and 25, in riding against the solid flat portion of plate 31, serve to establish very substantial locking resistance for the window sash enabling window sash to be maintained in any angular position to which the sash is moved.

To decrease manufacturing costs I may construct hardware for the window sash as represented in Figs. 19, 20, 21, 22, and 23. In the construction illustrated in Fig. 17 a plate member of relatively low-grade metal 22 is provided and is perforated to receive metallic inserts of high-grade tool steel constituting the segments 23 and 27. The inserts are riveted to the plate 40, and the plate 22 fastened to the sash 4. Thus the more expensive steel inserts constitute but a small portion of the over-all area of the hardware with commensurate saving in manufacturing costs.

As represented in Figs. 19, 20, and 21, the cam members carried by the sash 4 and the recesses carried by the sash strips 6 may be shaped to relieve the sudden frictional application of forces to opposite sides of the window frame. In Figs. 19-21 I have shown cam members 44 and 45 in the form of segments high in the center and tapering at each end thereof to the base plate 46 which is secured to sash 4. Base plate 46 carries the pindle 47 projecting transversely therefrom.

The coating sash strip 6 illustrated in Fig. 19 contains plate member extending portions 49 and 50 coating with cam-shaped segments 44 and 45 on the hardware carried by the sash 4. A central aperture 51 in plate 48 on sash strip 6 receives the projecting end of pindle 47. As the sash 4 is angularly shiftable from a vertical position to any selected angular position, the segmental cams 44 and 45 gradually displace the sash stripping 6 from the sash 4 against the action of spring 37 gripping the opposite sides of the window frame by frictional contact between the sash strip 6 and the stiles 2 against the action of springs 37. The release of the sash strip 6 from the stiles 2 is also effected gradually as the cam segments 44 and 45 ride out of the segmental recesses 49 and 56, respectively.

In Fig. 22 I have shown the hardware for the sash formed from cast metal constituting a plate 52 having a central pindle 53 thereon and a pair of symmetrically arranged cams 54 and 55 on opposite sides of pindle 53. This relatively inexpensive hardware is secured to opposite edges of the sash 4. Because of the relative inexpensive construction of the cast hardware of Fig. 22 replacement may be made from time to time at low cost.

In order to facilitate movement of the window sash with respect to the sash strips, I may form the cam members in the form of semi-spherical members as represented in Fig. 23 at 56 and 57. The semi-spherical members 56 and 57 are riveted into the plate 58 on opposite sides of the central pindle 53 as shown.

While I have described my invention in certain preferred embodiments, I realize that modifications may be made and I intend no limitations upon my invention other than may be imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. Hardware for controlling the position of a double-hung window sash in longitudinally extending stiles in a window frame for composite transitory and angular movement of the sash with respect to the window frame comprising sash strip members slidable in the stiles of a window frame and disposed at opposite edges of transitory and angularly movable window sashes, pindle members projecting from opposite sides of each window sash, a recessed plate member carried in each of the coating sash strips,
spring means interposed between the stiles and said sash strips and symmetrically disposed above and below said plate members, and means carried by said sashes and coacting with the recessed plate members carried by the coacting strip members and operative under control of the angular movement of the window sashes for simultaneously and transversely displacing said strip members for frictional gripping engagement with said stiles.

2. Hardware for controlling the position of a double-hung window sash in longitudinally extending stiles in a window frame for composite transulatory and angular movement of the sash with respect to the window frame comprising strip members slidable in the stiles of a window frame and disposed at opposite edges of translatory and angularly movable window sashes, hardware members attached to opposite sides of the window sashes, pintle members projecting from said hardware members and cam devices extending from said hardware members and symmetrically disposed on diametrically opposite sides of said pintle members, coacting hardware members carried by the inner faces of each of said strip members and being recessed to receive said pintle members and said cam devices, the external faces of said strip members being longitudinally recessed and spring means interposed between the longitudinal recessed strip members and the stiles for urging said strip members into engagement with the sides of said window sashes, whereby, said cam devices, upon rotation of said window sashes, about said pintle members frictionally engage the plate members carried by said strip members for forcing said strip members into frictional grip engagement with the stiles of said frame.

3. Hardware for controlling the position of a double hung window sash in longitudinally extending stiles in a window frame for composite transulatory and angular movement of the sash with respect to the window frame comprising sash strip members slidable in the stiles of a window frame and disposed at opposite edges of translatory and angularly movable window sashes, pintle members and symmetrically arranged cam members projecting from opposite edges of the central portions of each window sash, hardware carried by each of said sash strip members on the faces adjacent said window sashes in alignment with the pintle members and cam members carried by said window sashes and including recessed portions for receiving the pintle members, said sash strip members each having recesses in the faces adjacent said stiles and spring means operative in said recesses and interposed between said strip members and the stiles of the window frame for normally urging said sash strip members against the edges of said sashes, said cam members being operative under control of the angular movement of the window sashes for transversely displacing said sash strip members for effectsing frictional gripping engagement with said stiles.

4. Hardware for controlling the position of a double-hung window sash in longitudinally extending stiles in a window frame for composite transulatory and angular movement of the sash with respect to the window frame comprising sash strip members slidable in the stiles of a window frame and disposed at opposite edges of translatory and angularly movable window sashes, plate members secured to opposite edges of each of said window sashes, pintle members extending axially from said plate members in opposite directions from said sash, cam-like members extending from said plate members on diametrically opposite sides of said pintle members and symmetrically arranged with respect thereto, plate members carried by each of said sash strip members and having coacting recesses therein alignable with said pintle members, and means carried by said sash strip members having longitudinally disposed recesses therein in the faces thereof adjacent said stiles, flat spring members extending longitudinally of said strip members and interposed between said sash strip members and the window stiles for continuously urging said sash strip members against said sash window sashes, said cam members being operative from the control of said angular movement of said sash means for effecting the compression of said strip members against the action of said spring means into frictional gripping engagement with said stiles in the transverse position of said window sashes along said stiles.

5. Hardware for controlling the position of a double-hung window sash in longitudinally extending stiles in a window frame for composite transulatory and angular movement of the sash with respect to the window frame comprising sash strip members slidable in the stiles of a window frame and disposed at opposite edges of translatory and angularly movable window sashes, plate members attachable to opposite edges of said window sashes, pintle members and cam members each fastened to said plate members and extending transversely therefrom, coacting plate members carried by said sash strip members and having recesses therein for receiving the ends of said sash strip members against said plate members when said sash member is longitudinally extended, said sash strip members each having longitudinally extending recesses therein in the faces adjacent said stiles, a central projecting portion on each of said sash strip members in said recesses, flat leaf spring members disposed in said recesses and detachably connected to said central projecting portions of said sash strip members and yieldably extending between said sash strip members and said stiles, said sash strip members into engagement with the opposite edges of said window sashes, said sash strip members having recesses therein for receiving the ends of said flat leaf spring members when said sash strip members are transversely displaced by movement of said window sashes and operation of said cam members against the plate members carried by said sash strip members for frictionally gripping said window sashes.

6. Hardware for controlling the position of a double-hung window sash in longitudinally extending stiles in a window frame for composite transulatory and angular movement of the sash with respect to the window frame comprising sash strip members slidable in the stiles of a window frame and disposed at opposite edges of translatory and angularly movable window sashes, plate members secured to opposite edges of each window sash and having segmental-shaped tapered cam-like members projecting therefrom, a central pintle disposed axially within said segmental-shaped tapered cam-like members, coacting cam members carried by said sash strip members and having segmental-shaped tapered recesses therein, and a central recess therein respectively aligned with the segmental-shaped tapered cam-like members and the axially arranged pintle carried by the plate mem-
bers fastened to said sashes, said sash strip members each having longitudinally extending recesses in the faces thereof adjacent said stiles, spring means interposed in said longitudinally extending recesses between said sash strip members and said window stiles for normally urging said sash strip members into engagement with opposite sides of said window sashes, said segmental-shaped tapered cam-like members being operative for gradually shifting said sash strip members toward or away from said window stiles as said sashes are angularly shifted with respect to said window frame for locking or releasing said window sashes in selected angular positions with respect to said window frame.

7. Hardware for controlling the position of a double-hung window sash in longitudinally extending stiles in a window frame for composite translatory and angular movement of the sash with respect to the window frame comprising strip members slidable in the stiles of a window frame and disposed at opposite edges of translatory and angularly movable window sashes, hardware members attached to opposite sides of the window sashes, pintle members projecting from said hardware members and cam devices extending from said hardware members and symmetrically disposed on diametrically opposite sides of said pintle members, coacting hardware members carried by the inner faces of each of said strip members and being recessed to receive said pintle members and said cam devices, the external faces of said members being longitudinally recessed with a central projecting portion extending from the longitudinal recess in each of said strip members, a substantially flat longitudinally extending spring strip individual to each of said recesses and having an offset portion disposed centrally thereof and a pair of resilient end portions with a shoulder intermediate the connection of said offset portion and said end portions, said spring strip being yieldably engageable at the shoulders thereof with the central projecting portion for detachably gripping the opposite ends of the central projecting portion in the longitudinal recess of each of said strip members with the end portions of said spring strip bearing against the adjacent stile for urging said strip members into engagement with the sides of said window sashes, whereby said cam devices, upon rotation of said window sashes, about said pintle members frictionally engage the plate members carried by said strip members for forcing said strip members into frictional grip engagement with the stiles of said frame.

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